



NASA SBIR 2012 Phase I Solicitation

H3.03 Crew Accommodations and Water Recovery for Long Duration Missions

Lead Center: JSC

Participating Center(s): ARC, KSC, MSFC

Spacecraft crew accommodations requires volumetrically reconfigurable and hygienic crew interiors that maintain crew productivity. Advancements are required to reduce logistical packaging mass residual, repurpose logistical items for outfitting, provide extended wear clothing, clothes laundering, and metabolic waste collection/processing. Advancements in technology for water recovery are required to exceed existing 85% recovery from urine and humidity condensate. It is expected that both the variety of wastewater sources and the total volume of wastewater will increase with increasing mission duration. Technologies that increase closure of the water system and reduce expendables will enable future missions. Specific focus areas include:

Human Fecal & Waste Management:

- Technology is needed to collect, dry, process, and recover useful materials, and to safely store human feces, trash, and processed residuals. Technologies for micro-gravity collection of urine and feces should have modes that allow for operation even if active components fail, by relying on or being aided by passive processes for function, such as capillary forces. Minimal crew interaction, low energy, contamination tolerant waste processing systems that recover water, methane, or other useful materials are desired.

Logistical Repurposing:

- Novel alternatives to existing launch foam packaging materials that are light weight, have low frangibility, and can be compressed or heated to achieve low residual volume after launch.
- Launch packaging systems (bags, nets, hard structures) that can be repurposed or reconfigured on orbit to provide interior crew accommodations (sleep areas, exercise, hygiene, thermal/sound control) with minimal mass penalty.
- Logistical materials that can be readily processed or reformulated on orbit to provide atmospheric gases, water, or material for in-space fabrication processes with minimal power requirements.

Mixed Brine Water Recovery:

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- Recovery of water from mixed waste stream brines with 12% or higher dissolved solids are desired. Low energy, microgravity, low expendable systems should be tolerant of urine stabilization chemicals such as oxone, sulfuric acid and hexavalent chromium.

Biocide Delivery Systems:

- Technologies to replace the use of iodine for potable water disinfection. This may include techniques to replenish silver ions to a concentration of 0.4 mg/l in potable water or techniques to minimize the loss of silver ions in a potable water system. In addition, alternative disinfection technologies to inhibit biofilm formation on surfaces and provide residual disinfectant to maintain potable water quality would be considered.

Technology Readiness Levels (TRL) of 3 or higher are sought.

Potential NASA Customers include:

- Mission elements and vehicles:
- Orion Multi-Purpose Crew Vehicle.
- Multi-Mission Space Exploration Vehicle.
- Deep Space Habitat.
- Pressurized Rovers and Planetary Surface Systems.
- International Space Station.

Human exploration missions include:

- Low-Earth orbit, Earth's neighborhood (Earth-moon libration points, lunar orbit and surface, geosynchronous orbits, etc).
- Near-Earth Asteroids.
- Mars Missions (transit, orbit, moons and surface).

(<http://www.nasa.gov/exploration/home/index.html>)